2025

(xi) **Assertion (A):** As the level of water in a tall measuring cylinder kept under running tap rises, the pitch of sound gradually increases.

Reason (R): Frequency of sound is inversly proportional to the length of the water column.

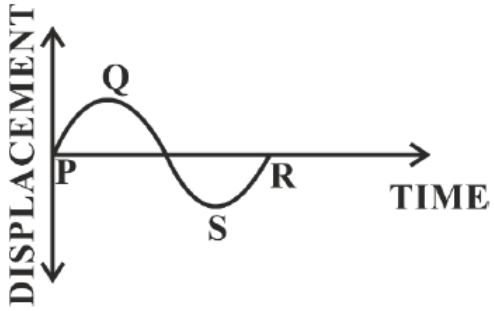
(a) Both (A) and (R) are true and (R) is correct explanation of (A).

(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

(iii) The displacement-time graph of a sound wave produced by a vibrating wire is shown below. [2]



(a) How will you adjust the tension in the wire, to **reduce** the length of **PR**?

(b) Which characteristic of sound is affected by the reduction in the length of **PR**?

(ii) A submarine in the sea, sends ultrasonic ping and a stopwatch is started simultaneously. The stopwatch stops on receiving the reflected wave from an obstacle and reads **1 minute 40 seconds**. Calculate the distance of the obstacle from the submarine. *(Speed of sound in water 1500 ms^{-1}.)* [3]

(ix) The amplitude of a sound wave is **reduced** from 2 mm to 1 mm. The **intensity** of the sound will:

(a) become four times the initial

(b) remain the same

(c) become half of the initial

(d) become one fourth of the initial

(xiv) A piece of a cake and a watermelon of the same mass are taken out of the freezer at the same time. Which of the following statement is correct?

(a) Cake and watermelon will attain the room temperature at the same time.

(b) Watermelon will attain the room temperature faster.

(c) Cake will attain the room temperature faster.

(d) Which one comes to the room temperature first, depends on the atmospheric pressure at that time.

(iii) Calculate the minimum distance needed in water to hear the echo. [2]

(Speed of sound in water is 1500 ms^{-1}. Persistence of hearing is 0.1 s.)

(vi) Define background radiation. Give one **internal** source of this radiation. [2]

(ii) (a) A man fires a gun and hears its echo after 3 s. The man then moves 80 m towards the hill and fires his gun again. This time he hears the echo after 2.5 s. Calculate the speed of the sound. [3]

(b) State **one** reason of using ultrasonic waves in SONAR.

Question 9

(i) A spirit lamp supplying heat at a rate of 50 W is used to melt 0.025 kg of ice at 0°C taken in a container. If all the ice in the container is melted in 168 s, then what is the specific latent heat of fusion of ice? [3]

(The heat capacity of the container is negligible.)

2024

(vi) When the stem of vibrating tuning fork is pressed on a table, the tabletop starts vibrating. These vibrations are **definitely** an example of:

(a) resonance

(b) natural vibrations

(c) forced vibrations

(d) damped vibrations

(vii) Rohan conducted experiments on echo in different media. He observed that a minimum distance of '*x*' meters is required for the echo to be heard in oxygen and '*y*' meters in benzene. Compare '*x*' and '*y*'. Justify your answer. [2]

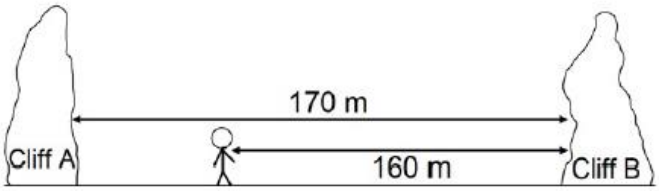
Speed of sound in oxygen: 340 ms^{-1}

Speed of sound in benzene: 200 ms^{-1}

Question 7

(i) (a) Name the waves used in SONAR. [3]

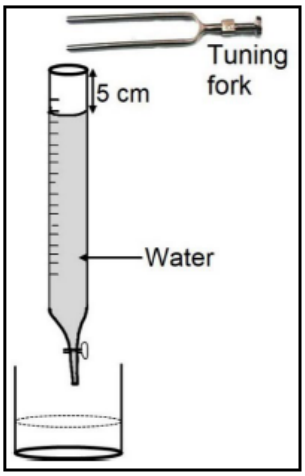
(b)



In the above diagram Lata stands between two cliffs and claps her hands. Determine the time taken by her to hear the **first** echo.

Speed of sound in air 320 ms^{-1}.

(iii) In the given diagram, a vibrating tuning fork is kept near the mouth of a burette filled with water. The length of the air column is adjusted by opening the tap of the burette. At a length of 5 cm of the air column, a **loud sound** is heard. [4]



(a) Name the phenomenon illustrated by the above experiment.

(b) Why is a loud sound heard at this particular length?

(c) If the present tuning fork is replaced with a tuning fork of higher frequency, should the length of the air column increase or decrease to produce a **loud sound**? Give a reason.

2023

(vii) When a body vibrates under a periodic force, the vibrations of the body are always:

(a) natural vibrations

(b) damped vibrations

(c) forced vibrations

(d) resonant vibrations

(viii) Two notes are produced from two different musical instruments, such that they have same loudness and same pitch. The produced notes differ in their:

(a) Waveform

(b) Frequency

(c) Wavelength

(d) Speed

(vi) A metal foot ruler is held at the edge of a table. It is pressed at its free end and then released. It vibrates. [2]

(a) Name the vibrations produced.

(b) State *one* way to increase the frequency of these vibrations.

Question 7

(i) (a) Which characteristic of sound is affected due to the larger surface of a school bell? [3]

(b) Calculate the distance covered by the Ultrasonic wave having a velocity of 1.5 $\mathbf{kms^{-1}}$ in 14 s, when it is received after reflection by the receiver of the SONAR.

2021

18. Select a correct option with respect to echo depth sounding: [1]
    (a) infrasonic waves are used.
    (b) the frequency of the waves used is between 20 Hz and 20,000 Hz.
    (c) ultrasonic waves are used.
    (d) supersonic waves are used.

19. **Which one of the following diagnostic methods use reflection of sound?** [1]

(a) CT scan (b) Electrocardiogram

(c) Echo cardiogram (d) MRI

20. A boy standing in front of a wall produces two whistles per second. He notices that the sound of his whistling coincides with the echo. The echo is heard only once when whistling is stopped. Calculate the distance between the boy and the wall. (The speed of sound in air = 320 m/s)

(i) The time in which the boy hears the echo is
(a) 1 s (b) 0.5 s
(c) 1.5 s (d) 2 s [1]

(ii) The distance at which the boy is standing from the wall [1]
(a) 160 m (b) 240 m
(c) 320 m (d) 80 m

(iii) If the speed of sound is increased by 16 ms^{-1} and the boy moves 4 m away from the wall then in how much time will he hear the echo of the first whistle? [1]
(a) 0.525 s (b) 0.5 s
(c) 0.48 s (d) 0.3 s

(iv) In which of the following timings of reflection of the whistle, the echo cannot be heard? [1]
(a) 0.05 s (b) 0.12 s
(c) 0.2 s (d) 0.11 s

Q. 1. Choose the correct answers to the question from the given options. (Do not copy the question. Write the correct answer only.) [10]

(i) Free vibrations are

(a) the vibrations under the influence of a periodic force.

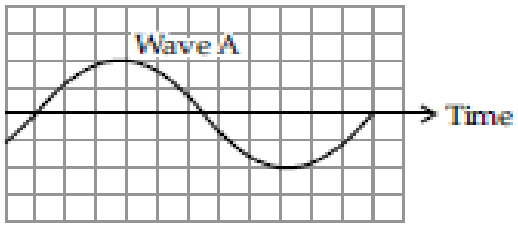
(b) the vibrations with larger amplitude.

(c) the vibrations when the frequency continuously decreases.

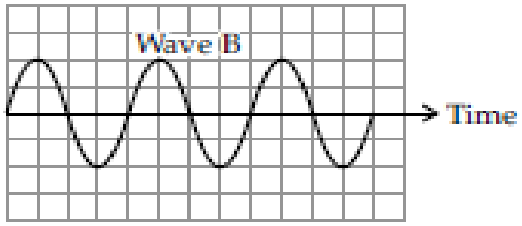
(d) the vibrations with a constant frequency and constant amplitude.

(ii) The diagram below shows four sound waves. Which sound has the highest pitch?

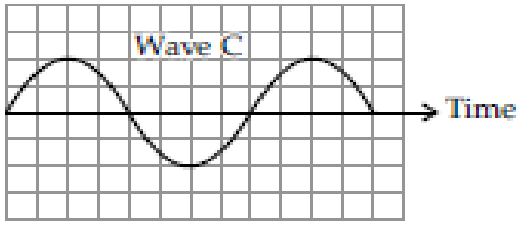
(a)



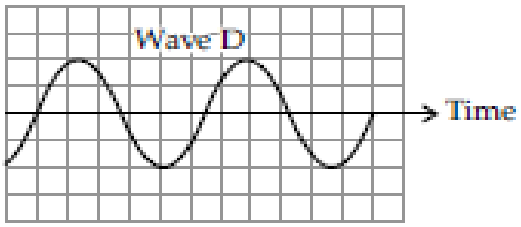
(b)



(c)



(d)



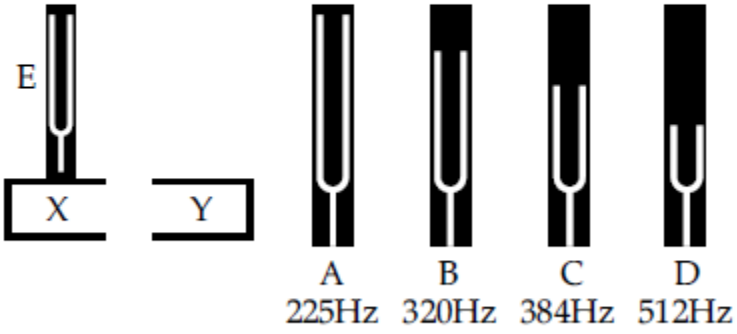
Q. 4. (i) Rohit playing a flute and Anita playing a piano emit sounds of same pitch and loudness. [3]

(a) Name one characteristic that is different for waves from the two different instruments.

(b) If now the loudness of the sound from flute becomes four times that of the sound from piano, then write the value of the ratio $A_F : A_P$ (A_F–amplitude of sound wave from flute, A_P – amplitude of sound wave from piano)

(c) Define 'Pitch' of a sound.

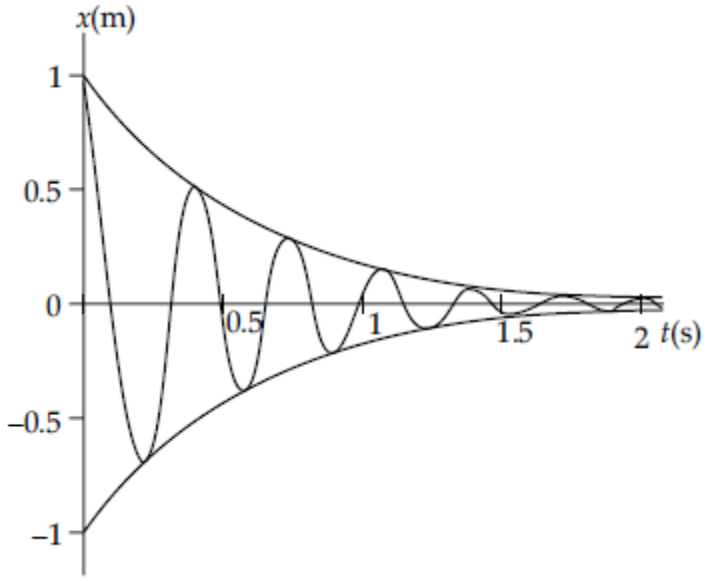
(ii) The diagram below shows a vibrating tuning fork E mounted on a sound box X. When the vibrating tuning forks A, B, C and D are placed on the sound box. Y one by one, it is observed that a louder sound is produced when the tuning fork k. B is place on Y. [3]



(a) What is the frequency of tuning fork E?

(b) Why does B produce a louder sound?

Q. 6.



(i) Study the above figure and answer the following: [3]

(a) What type of vibration does the above figure represent?

(b) State one reason for which the amplitude of the vibration decreases with time.

(c) Write an example of natural vibrations.

2020

(b) Draw a graph between displacement from mean position and time for a body executing free vibration in a vacuum. [2]

(c) A sound wave travelling in water has wavelength 0.4 m. [2]
Is this wave audible in air? (The speed of sound in water = 1400 ms^{-1})

(d) Why does stone lying in the sun get heated up much more than water lying for the same duration of time? [2]

(b) (i) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse. [3]

(ii) What are acoustically measurable quantities related to pitch and loudness?

(b) Two waves of the same pitch have amplitudes in the ratio 1: 3. [2]

What will be the ratio of their:

(i) intensities and

(ii) frequencies?

(d) (i) Define resonant vibrations. [2]

(ii) Which characteristic of sound, makes it possible to recognize a person by his voice without seeing him?

2019

Question 7

(a) It is observed that during march-past we hear a base drum distinctly from a distance compared to the side drums. [3]

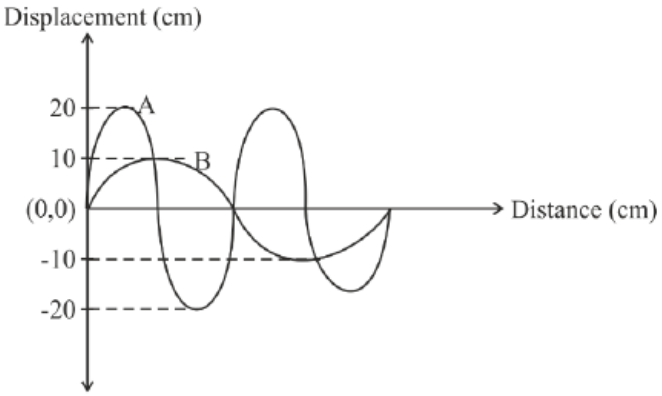
(i) Name the characteristic of sound associated with the above observation.

(ii) Give a reason for the above observation.

2018

Question 3

(a) Displacement distance graph of two sound waves A and B, travelling in a medium, are as shown in the diagram below. [2]



Study the two sound waves and compare their:

(i) Amplitudes

(ii) Wavelengths

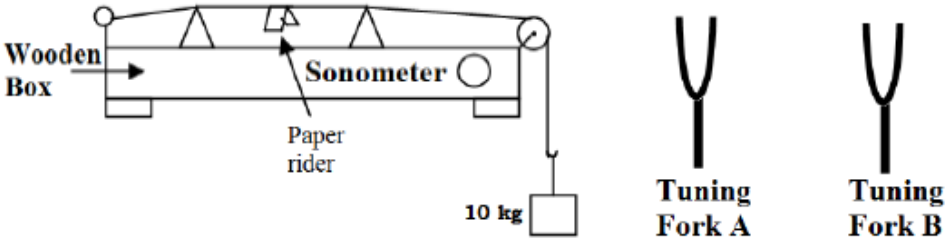
(d) (i) What do you understand by free vibrations of a body? [2]

(ii) Why does the amplitude of a vibrating body continuously decrease during damped vibrations?

Question 7

(a) Draw the diagram of a right angled isosceles prism which is used to make an inverted image erect. [3]

(b) [3]



The diagram above shows a wire stretched over a sonometer. Stems of two vibrating tuning forks A and B are touched to the wooden box of the sonometer. It is observed that the paper rider (a small piece of paper folded at the centre) present on the wire flies off when the stem of vibrating tuning fork B is touched to the wooden box but the paper just vibrates when the stem of vibrating tuning fork A is touched to the wooden box.

(i) Name the phenomenon when the paper rider just vibrates.

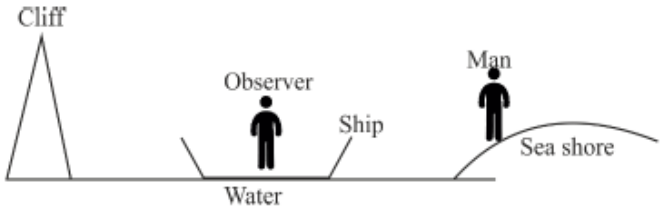
(ii) Name the phenomenon when the paper rider flies off.

(iii) Why does the paper rider fly off when the stem of tuning fork B is touched to the box?

(c) A person is standing at the sea shore. An observer on the ship which is anchored in between a vertical cliff and the person on the shore, fires a gun. The person on the shore hears two sounds, 2 seconds and 3 seconds after seeing the smoke of the fired gun. If the speed of sound in the air is 320 ms^{-1} then calculate: [4]

(i) the distance between the observer on the ship and the person on the shore.

(ii) the distance between the cliff and the observer on the ship.



2017

(b) The human ear can detect continuous sounds in the frequency range from 20 Hz to 20,000 Hz. Assuming that the speed of sound in air is 330 ms^{-1} for all frequencies, calculate the wavelengths corresponding to the given extreme frequencies of the audible range. [2]

(c) An enemy plane is at a distance of 300 km from a radar. In how much time the radar will be able to detect the plane? Take velocity of radiowaves as 3×10^8 ms^{-1}. [2]

(d) How is the frequency of a stretched string related to: [2]

(i) its length?

(ii) its tension?

Question 8

(a) Name the factor that determines: [3]

(i) Loudness of the sound heard.

(ii) Quality of the note.

(iii) Pitch of the note.

(b) (i) What are damped vibrations? [3]

(ii) Give one example of damped vibrations.

(iii) Name the phenomenon that causes a loud sound when the stem of a vibrating tuning fork is kept pressed on the surface of a table.

(c) (i) A wire of length 80 cm has a frequency of 256 Hz. Calculate the length of a similar wire under similar tension, which will have frequency 1024 Hz. [4]

(ii) A certain sound has a frequency of 256 hertz and a wavelength of 1.3 m.

1. Calculate the speed with which this sound travels.
2. What difference would be felt by a listener between the above sound and another sound travelling at the same speed, but of wavelength 2.6 m?

(ix) Two sound waves X and Y have the same amplitude and the same wave pattern but their frequencies are 60 Hz and 120 Hz respectively, then

(a) X will be shriller and Y will be grave

(b) X will be grave and Y will be shriller

(c) X will differ in quality than Y

(d) X is louder than Y.

(ii) A person standing in front of a cliff fires a gun and hears its echo after 3s. If the speed of sound in air is 336 ms^{-1}

(a) Calculate the distance of the person from the cliff.

(b) After moving a certain distance from the cliff, he fires the gun again and this time the echo is heard 1.5 s later than the first. Calculate the distance that the person moved.